EXHIBIT 3

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 1                 UNITED STATES DISTRICT COURT
 2              MIDDLE DISTRICT OF NORTH CAROLINA
 3     SHAUNA WILLIAMS, et al.,    )
                                   )
 4             Plaintiffs,         )
                                   )
 5        v.                       ) Civil Action No. 23 CV
                                   ) 1057
 6     REPRESENTATIVE DESTIN HALL,)
       in his official capacity as)
 7     Chair of the House Standing)
       Committee on Redistricting,)
 8     et al.,                     )
                                   )
 9             Defendants.         )
       ------------------------   )
10     NORTH CAROLINA STATE        )
       CONFERENCE OF THE NAACP,    )
11     et al.,                     )
                                   )
12             Plaintiffs,         )
                                   )
13        v.                       ) Civil Action No. 23 CV
                                   ) 1104
14     PHILIP BERGER, in his       )
       official capacity as the    )
15     President Pro Tempore of    )
       the NORTH CAROLINA Senate, )
16     et al.,                     )
                                   )
17             Defendants.         )
       --------------------------)
18
19        Videoconference deposition of MICHAEL BARBER, PhD,
20     taken by counsel for the Plaintiffs, on Wednesday,
21     October 30, 2024, beginning at 8:02 a.m. MDT.
22
23                        - - -
24     Stenographically Reported by Christina Essi Pagano, RPR
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Page 1

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 1                  A P P E A R A N C E S

 2

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24

25     (Appearances continued page 3)
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Page 2

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 1    (Appearances continued)

 2

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 1                      I N D E X

 2                                              Page

 3     WITNESS:  MICHAEL BARBER, PhD
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 6

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 8                    E X H I B I T S

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1   A   No, it did not. That's the main criticism that

2   I have of his analysis, is that it lacks a measure of

3   partisanship.

4   Q   And then you also state that you include a

5   variable indicating if the precinct is located within the

6   district's major city, and you say here, as identified by

7   Dr. Rodden. So I take it that Dr. Rodden's regression

8   analysis also included this variable?

9   A   In some cases, yes, and in other cases, no,

10   but I tried to mirror as closely as possible what he did

11   with regard to that variable.

12   Q   And then you also have a variable measuring the

13   precinct's distance from the district's geographic center

14   of population; was that variable included in Dr. Rodden's

15   analysis?

16   A   Yes.

17   Q   Have you ever published a paper involving a

18   regression model where two of the independent variables

19   are correlated above 0.9?

20   A   I don't, off the top of my head, know if I have

21   or have not. I would need to go back into the datasets

22   and look.

23   Q   Are you familiar with the term

24   multicollinearity?

25   A   Yes, I am.

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 1        Q     What does it mean, in your field?

 2        A     It means the presence of correlation between

 3    two independent variables in a regression model.

 4        Q     Are party and race highly correlated in

 5    North Carolina?

 6        A     To varying degrees, yes.  It's not constant

 7    across the state.  It differs in different regions of

 8    the state.

 9        Q     Do you know how correlated it is in the areas

10    where the challenged Congressional districts are?

11        A     I could not tell you the numbers off the top of

12    my head.  I believe Dr. Rodden provides those in his

13    reply report.

14        Q     Okay.  So let's look at page 7 of Dr. Rodden's

15    reply report.  So he notes at the top here, in

16    Dr. Barber's VTD level dataset, the correlation between

17    the Democratic vote share and BVAP is 0.85 in the

18    envelope of District 6, 0.88 in the envelope of

19    District 12, 0.82 in the envelope of District 14, and

20    0.96 in the envelope of District 1; did you verify these

21    correlations?

22        A     No, I have not had time or reason, really, to

23    dig into his replication data.

24        Q     And you don't dispute -- or, sorry, do you have

25    any reason to dispute them?
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1   MS. RIGGINS: Objection.

2   THE WITNESS: I mean, I don't want to -- I

3   don't know. I would need to look to verify them.

4   I guess I'd have to say I just don't know.

5   Q   But sitting here today, you don't have any

6   basis to dispute them?

7   A   No, I don't have any specific reason to dispute

8   the numbers in this paragraph.

9   Q   Would you agree that all of these levels of

10   correlation are above 0.8?

11   A   Yes, they are all above 0.8.

12   Q   And one of them is very close to 1; it's 0.96?

13   A   That is correct.

14   Q   Would you agree that all of these are highly

15   correlated?

16   A   I think correlation is a continuous scale and

17   I think we talked about a correlation a few hours ago

18   that was moderately high. I think here we can say --

19   maybe we can separate the ones in the 80s from the one

20   that's 0.96 and I think we could all agree that 0.96 is

21   very high. I think the ones in the 80s, we could say,

22   are high. I think that it's -- correlation is a

23   continuous measure and there's no definitively agreed

24   upon threshold at which, you know, scholars would agree

25   if something is high or low. It's a spectrum.

1   Q   Does including two highly correlated variables

2 in the same regression change how the regression works?

3   A   It does not change how the regression works.

4 Regardless of the correlation between the two independent

5 variables, the regression does the same thing.

6   Q   Does including two highly correlated variables

7 in the same regression impact the results of the

8 regression analysis?

9   A   Any time you include an additional variable,

10 it is going to have some correlation with other

11 independent variables included in the model. Even if

12 that correlation is zero, that is a measure of

13 correlation. It simply has zero correlation. Any time

14 an additional variable is included in a model, it will

15 have impacts on the other regression coefficients for

16 exactly the reason that they are correlated. That's the

17 point of a multivariant regression, is to include

18 additional variables that may be correlated with the

19 original variable or with the other variables, because

20 the researcher is interested in understanding what are

21 called partial correlations. In other words, the impact

22 of one variable independent of the impact of the other

23 variables included in the model.

24   Q   Is there a point at which collinearity of

25 regression variables becomes an issue such that it --

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1   because it makes it hard to interpret the regression

        2   analysis?

        3   A   If two variables are perfectly correlated at 1,

        4   then it is impossible to include both of those variables

        5   in the regression. The regression will simply not work.

        6   It will not produce a result. Beyond that, it's a matter

        7   of -- it's a matter of degrees. It's a matter of -- and

        8   it's not simply a measure of how correlated the two

        9   variables are. It's a multidimensional problem and by

       10   problem, I don't mean that in a negative way. I mean,

       11   it's a multidimensional question and so there's a variety

       12   of factors that go into the results that you get from a

       13   regression, not just the correlation between two

       14   independent variables that you might be interested in

       15   including in your regression model.

       16   Q   So it sounds like you will not run a regression

       17   model using two independent variables that were perfectly

       18   correlated at 1; is that right?

       19   A   It can't be done.

       20   Q   So let's take the 0.96 correlation between

       21   Democratic vote share and BVAP in District 1. How would

       22   including those two -- if we take the 0.96 number as

       23   true, how does including those two independent variables

       24   in the same regression -- how would that affect the

       25   analysis?

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 1              MS. RIGGINS:  Objection.  Go ahead.
 2              THE WITNESS:  It's very hard to say.  It's
 3       hard to know and the reason it's hard to know is
 4       because it not only depends on the correlation
 5       between those two variables, but it also depends on
 6       the particular values of individual data points.  It
 7       depends on the correlation between those two
 8       variables and the other variables that are included
 9       in the model and it also depends on the correlation
10       of those two variables with the outcome variable, the
11       dependent variable.  So it's a very multidimensional
12       problem and, as a result, researchers don't -- you
13       can't really know with certainty the impact it's
14       having on your regression model.  I guess I should
15       say, you can't know without doing a variety of
16       additional analyses.
17          Q    You said earlier something about it being a
18     matter of degree.  So is it fair to say that if two
19     independent variables are correlated at zero, there's no
20     correlation, then there's no multicollinearity concern
21     with including both in one regression model?
22          A    Those variables could be correlated with other
23     variables in the model, --
24          Q    Right.
25          A    -- but there is no multicollinearity if they're
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1   not correlated with one another. So multicollinearity is

2   a question of correlation between variables. So those

3   variables could definitely have multicollinearity with

4   other variables in the model, but they're not correlated

5   with one another.

6   Q   Okay. And as a result, if you were to add an

7   independent variable that was not correlated with any of

8   the other existing independent variables, there would be

9   no risk that adding that variable would introduce noise

10   or variance that would be hard to understand?

11   MS. RIGGINS: Objection. Go ahead.

12   THE WITNESS: If you add in a variable that

13   was completely exogenous, completely uncorrelated

14   with any of the other independent variables, I still

15   think that because that -- insofar as that variable

16   is correlated with the dependent variable, it could

17   also still have impact on the other independent

18   variables in the model.

19   Q   Do you typically, when you are conducting

20   regression analyses, try to minimize the number of

21   independent variables that have high degrees of

22   correlation with one another?

23   A   No. That's not usually a priority when you

24   build a regression model.

25   Q   Once you kind of have run your regression and

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1   gotten the various coefficients, is there anything that

2   you can do to try to figure out whether multicollinearity

3   affected those coefficients?

4   A   I suppose there are some measures that you can

5   calculate to try and capture the degree to which they're

6   correlated with one another or to capture the potential

7   relationship that exists that you could conduct after

8   running a regression model.

9   Q   What would that kind of like post-regression

10   model analysis tell you?

11   A   It can tell you, one, the degree to which

12   they're correlated. It could tell you the degree to

13   which they're correlated in the context of all the other

14   variables that are included in the model. It can give

15   you an estimate of the variation or the variance, the

16   variation that's induced in the model through the

17   correlation. And then I guess the last thing is, what

18   you're really estimating is the impact of the one

19   variable on the outcome independent of the impact on the

20   other variable on the outcome.

21   Q   Did you undertake that kind of check after

22   running your regressions here?

23   A   I simply produced the regression results. So

24   the results are telling us the relationship between the

25   one variable independent of the other variable. These

1   additional post-regression diagnostics that I'm

2   describing, I did not -- neither me nor Dr. Rodden

3   produced those statistics.

4   Q   Why didn't you produce those statistics here?

5   A   I don't think that they are of particularly

6   great value in this case because, regardless of what they

7   say, we need to include both of those variables in the

8   model. There's no value in running the regression with

9   only a measure of race or only a measure of party.

10   The only value that these regressions produce is when

11   they're both included, because that is the question that

12   we are seeking to answer, the impact of race independent

13   of partisanship. If both variables are not included in

14   the model, then the model is not getting us any closer to

15   answering that question and at that point, why even

16   bother including the model? It's not useful.

17   Q   But it's possible that the model is also not

18   useful if two of the variables are so highly correlated

19   that it's basically meaningless?

20   MS. RIGGINS: Objection. Go ahead.

21   THE WITNESS: Well, I think I dispute the

22   characterization of it as meaningless. No regression

23   model is perfect. That's the nature of regression

24   models. And so now it's a matter of which models are

25   more informative or more helpful than others. And my

1   opinion is that a model with partisanship and race

2   both included, even with the correlation that exists

3   between those two variables, is more valuable and is

4   more useful than a regression model that only

5   includes race or only includes partisanship. I do

6   not think that those models are really useful at all.

7   Q   Let's flip back to your report. I just have a

8   few more questions and then we can consider whether it

9   makes sense to break for lunch. But if I go back to

10   page 18 of your report, you also mention at the end, to

11   account for the need to achieve relative population

12   parity, I also include a variable measuring the total

13   population of each precinct?

14   A   Yes.

15   Q   How does this control for population equality

16   in a district?

17   A   What it accounts for is the fact that precincts

18   might -- stepping back, the purpose of the regression is

19   to identify what factors appear to be influential in the

20   selection of a precinct into a Congressional district.

21   One factor that's really important in creating

22   Congressional districts is population parity, and so when

23   a map drawer is deciding whether to move a precinct into

24   a district, one of the factors that they need to consider

25   is the population size of the precinct. So if you can

1   correlated.

2   Q   Could you have undertaken your own correlation

3   analysis?

4   A   With sufficient time and resources, yes.

5   Q   You applied the county envelope analysis to a

6   set of simulated maps to test its reliability; is that

7   right?

8   A   Yes, that's correct.

9   Q   And you also applied it to the

10   2022 Special Master Map?

11   A   I believe so, yes.

12   Q   In doing so, did you run -- just to make sure

13   I'm understanding, you ran your regression analysis. You

14   ran the same regression analysis that you ran earlier in

15   your report and you did not try to replicate Dr. Rodden's

16   regression analysis on these simulated maps; is that

17   correct?

18   A   That's correct. I ran the same analysis that I

19   conducted earlier in my report.

20   Q   So that analysis includes both race and party

21   as variables?

22   A   Yes, it does.

23   Q   And your opinion on page 27 of your report, at

24   the bottom of this section, is that, given the results,

25   it is my opinion that the envelope method is not a

1   reliable method for determining if race played a

2   significant role in the assignment of precincts to

3   districts; is that right?

4   A   Yes.

5   Q   And then turning to page 5 of your report,

6   where you include a summary of conclusions, the second

7   conclusion you list here is that the county envelope

8   method is not a reliable method for examining the degree

9   to which race played a role in the construction of

10   district boundaries because it incorrectly identifies

11   race as a significant factor when race, in fact, played

12   no role in the process. What do you mean by the degree

13   to which race played a role?

14   A   So in the simulations, the districts are

15   constructed with no information about the racial

16   composition of individual precincts or the state overall

17   or the districts that are then assembled from those

18   precincts. So we know ahead of time that race played no

19   role in the development of these districts in the

20   simulation. It was just not a factor that the computer

21   had access to. And yet when we do the county envelope

22   analysis, it identifies race as a statistically

23   significant predictor of the district's composition more

24   than a majority of the time, even though we knew ahead of

25   time race played no factor in the composition of those

1   districts. So, in other words, the county envelope

2   method, when applied to a truly race-neutral map, flags

3   most of the districts as race playing a significant

4   factor in the composition of the district. They're all

5   false positives.

6   Q   How are you determining whether your regression

7   analysis is flagging race as a significant factor; what

8   is the threshold that you're using there?

9   A   So I'm using the same threshold that Dr. Rodden

10   is using in the identification of the variable measuring

11   race as whether or not it is statistically significant.

12   Q   Just to confirm, when you refer here to the

13   fact that race played no role in the process, you mean in

14   reference to your simulated maps, correct?

15   A   That's correct.

16   Q   So you don't know, sitting here today, if race

17   played any role in the 2023 redistricting, correct, in

18   terms of, you're not speaking to the intent of the

19   legislators?

20   A   I don't have a view into the subjective intent

21   of the people who drew the 2023 map.

22   Q   And you're not opining here on whether the

23   envelope method, used in combination with the other

24   approaches that Dr. Rodden uses, can shed some light on

25   whether racial sorting exists, correct?

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1   A   Well, I'm opining that the county envelope

2   method, in my opinion, sheds no light on whether race was

3   a significant factor or not; and so I suppose that, in

4   combination with other things, it provides no added value

5   in my opinion.

6   Q   Okay. And just to make sure, so I'm not asking

7   about whether race was a significant factor, but whether

8   racial sorting exists at all. So not whether it was

9   significant or what the intent was, but just rather

10   whether there is racial sorting of the districts.

11   A   I suppose I don't fully understand what you

12   mean by racial sorting.

13   Q   Whether voters are disproportionately included

14   in a particular district or not, included based on their

15   race. Setting aside whether their actual underlying

16   reason might be their party or something like that, but

17   just whether there exists any kind of effect that we can

18   observe with respect to how voters are included or not

19   included in districts based on their race.

20   A   I don't think the county envelope method is

21   necessary to identify if there are differences in the

22   regional composition of the districts. I think in that

23   case, we can just look and see the summary statistics.

24   The district has X percent of the district. X percent of

25   the population are Black. That's something we can

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 1      identify without conducting any sort of county envelope

 2      analysis.

 3                   MS. JASRASARIA:  I'm at a good stopping point

 4        if this is a good time to break for lunch.

 5                   THE WITNESS:  Wonderful.

 6                   MS. JASRASARIA:  Let's go off the record.

 7                   (There was a lunch recess taken.)

 8      BY MS. JASRASARIA:

 9           Q     Welcome back, Dr. Barber.

10           A     Thank you.

11           Q     So I'd like to continue our discussion of your

12      report.  I'm going to share my screen again.  So I'd like

13      to turn to page 29 of your report, which is where you

14      discuss the core-in-out analysis that Dr. Rodden

15      conducted.  Were you familiar with the core-in-out

16      analysis before reviewing Dr. Rodden's report?

17           A     Yes, I was familiar with it.

18           Q     Where had you seen it before?

19           A     I've seen it in -- I don't know that I could

20      identify specific cases.  I've been aware of it simply by

21      virtue of being involved in redistricting cases, but more

22      specifically, I'm aware of a similar -- it's not exactly

23      this type of analysis, but a similar analysis that was

24      done in a redistricting case that I am involved in, in

25      Alabama.
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 1       A    Okay.  So I think the first problem is you're

 2    making a comparison to a very small set of maps.  100

 3    maps is far outside the norm in terms of comparisons.

 4    Beyond that, this comparison is problematic for the same

 5    reasons that the analysis he does earlier is problematic,

 6    in that it does not disentangle race from partisanship.

 7    So he's suggesting here the plan is a racial outlier, but

 8    there's no analysis showing if this plan -- if the

 9    enacted map is also a partisan outlier, even in

10    comparison to these 104 maps.  Because these -- even

11    though a map might have 10 Republican-leaning seats, if

12    all 10 of those seats are just barely across the line, as

13    we talked about at the very beginning this morning,

14    that's different than if the 10 seats are beef-ly

15    Republican.  The analysis here and the figures here don't

16    show us whether or not that is the case.  It very well

17    could be the case that there are no maps that have the

18    same partisan composition as the enacted map in terms of

19    not only the number of Republican-leaning seats but the

20    relative safety of those seats.

21       Q    Did you review the draft maps that Dr. Rodden

22    included in his reply report analysis?

23       A    I have not.

24       Q    Do you have any reason to dispute the BVAP

25    distribution that he showed in his analysis?
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1   A   I have not -- I have not looked at these draft

2   maps. I don't know -- I couldn't say anything about

3   these draft maps at this point.

4   Q   Let me stop sharing my screen for a moment.

5   Dr. Barber, what is your understanding of how a Court

6   determines whether a district is a racial gerrymander?

7   MS. RIGGINS: Objection. Go ahead.

8   THE WITNESS: I don't know that I can answer

9   that question. I think that a judge makes that

10   decision and I don't really know how a judge makes

11   that determination.

12   Q   Are you familiar with the concept of racial

13   predominance?

14   A   I'm familiar with the phrase, yes.

15   Q   What is your understanding of what that phrase

16   means?

17   A   I think that it has -- I think that phrase has

18   a kind of special legal standing or kind of legal --

19   lawyers have a very different -- like, a special

20   definition of what that means. I'm not trying to

21   describe what that is, because I'm not a lawyer and I'm

22   not making any sort of legal determinations. In my

23   own -- sorry, go ahead.

24   Q   No, go for it.

25   A   In my own non-legal understanding, I think

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